Biomathematics in Ecology, Education, and Research (BEER) abstract - 250 words
Symposium presentation and (potential) manuscript to submit to Letters in Biomathematics

Title: Mosquito ecology, arbovirus dynamics, and control

Reductions in mosquito population size through mosquito control is a primary method of reducing transmission of mosquito-borne arboviruses such as Dengue, Chikungunya or Zika viruses. Mosquito ecology is a critical factor in arbovirus dynamics and control efficacy and should be explicitly considered in the development of novel mosquito control methods. Autodissemination is a relatively new control method, where female mosquitoes are used as vehicles for insect growth regulators (IGR). Females are contaminated with IGR at treatment stations attractive to egg-laying females. They then deposit the IGR in natural oviposition sites, reducing mosquito emergence. An individual based model was developed to explore the effects of landscape and mosquito ecology. As expected, higher densities of natural oviposition sites increased mosquito population size. Control by autodissemination stations was effective, decreasing population size at the low and high densities modeled. Treated mosquitoes moved farther than expected in a field experiment and in the model. Preliminary results exploring variation in spatial scales and flight distances suggest that control was efficacious even with larger spatial distributions of natural sites. The distance travelled by treated mosquitoes depended on both the flight distance (per time step) and distribution of natural sites. Under some conditions, mosquitoes clustered near oviposition sites, decreasing movement of the IGR. Initial results suggest an interaction between the proportion of eggs laid in one site and flight distance. Autodissemination strategies may be effective with relatively few treatment stations, and integrating ecological variables into modelling studies is important to understand the potential efficacy of this technique.

Keywords: Aedes mosquitoes, autodissemination, oviposition, individual based model, arbovirus